It is also to be hoped that all persons who approve of the proposition to reform the calendar will write to the Swiss Federal Council immediately, expressing their approval of and giving their ideas on the subject.

J. M. Clifford, Jr.

SCIENTIFIC BOOKS

Elementary Entomology. By E. Dwight Sanderson and C. F. Jackson. Ginn & Co. 1912. Pp. vii + 372.

"During recent years there has been an increasing demand for short courses in elementary entomology. For several years past the authors have been endeavoring to present such courses to their students, but have encountered the difficulty that no text-book was available which met their needs. This book is, therefore, the author's effort to furnish such a text for beginners. . . ."

In a brief introduction the authors point out the important rôle insects play in the transmission of disease, and emphasize their importance as agricultural pests. Their explanation of why insects are so numerous in individuals and in species is not clear. "The immense number of insects, both of species and of individuals, is undoubtedly due to their varied structure which enables them to live under all possible conditions. . . . Thus the insects possess such diversity of structure and habit that they are able to live under all external conditions, and on account of their immense numbers they have been able to adapt themselves to a changing environment which would have entirely obliterated classes or species few in number." In other words, insects are numerous because they are diverse in structure and are diverse in structure because they are numerous.

The book is divided into three parts: I., The Structure and Growth of Insects, 62 pages; II., The Classes of Insects, 208 pages; III., Laboratory Exercises, 84 pages.

In Part I. a brief chapter is devoted to the near relatives of insects. The figure of the spider illustrating the arachnida is from a photograph taken at such an angle that it does not show the division of the body into cephalothorax and abdomen mentioned in the text, but does show the modified antennæ (cheliceræ) which, according to the text, are not possessed by Arachnida. The treatment of the Myriapoda is inadequate even for an elementary text. No distinction is made between the Diplopods and Chilopods, and while the figure shows a Diplopod with two pairs of legs to each segment, the text says that "each segment bears a pair of legs." The same statement is repeated in the table on page 9.

The twenty-four pages devoted to the anatomy of insects show the same evidence of hasty and careless work. The original figure of a typical maxilla of the grasshopper (Fig. 11) omits the cardo. We are told that the mandibles are always essentially biting organs, though many of the copied illustrations show their piercing form. We would agree with the authors that the mandibulate mouth-parts of the different orders are "apparently homologous," but what reason is there for believing that the types of suctorial mouth-parts are "entirely dissimilar in structure and origin"? However, it is consistent with such a belief that the illustrations of the mouth-parts of the mosquito and horse-fly (18 and 20), "good examples of the piercing type," should be labeled without further discussion, according to radically different interpretations, and that Fig. 15 is referred to on page 18 as of dipterous mouth-parts, though it is correctly labeled as hemipterous.

We are told on page 24 that "the wings are strengthened by numerous thickenings called *veins,* whose number and position form the basis of the classification of families, genera and species." Then, important as the subject would seem to be, a half paragraph, accompanied by an incorrectly labeled figure of the wing of a house fly, is devoted to a summary of the Comstock-Needham system, while in the systematic portion thirteen dipterous wings labeled according to this same system are illustrated and the key to families uses another system which is not even mentioned —not to say *explained*—in the text.

In the chapter on growth and transformations of insects the authors fail to make very clear the real distinction between complete and incomplete metamorphosis. "The transformation of the butterfly from the caterpillar is a *complete* one, and is known as a complete metamorphosis. The growth of the grasshopper, on the other hand, is gradual and presents no striking changes, and is known as *incomplete metamorphosis.*" In view of this definition the elementary student will be at a loss to understand why later in the book the Aptera are said to have no metamorphosis. As illustrations of the types of metamorphosis an account is given of the life history of the squash-bug, differential locust, tent caterpillar and spiny elm caterpillar. The account of the squash-bug is apparently from first-hand observation, the others are poorly digested from Morgan and Weed. A confusing error occurs in the account of the differential locust; Fig. 66 shows five grasshopper nymphs of various sizes and the legend says "First three stages of the nymphs of the differential locust"; Fig. 68 shows the last two. The text says that the different stages will be found in Fig. 67, which is a picture of an egg mass.

Part II., The Classes of Insects, opens with a chapter on classification which the authors could improve greatly by adopting a more direct and concise style.

The orders are then taken up in the usual sequence and treated very briefly. There is a superabundance of good figures, mostly borrowed, and the text often takes the form of a running comment on the pictures in the style of a stereopticon lecture, rather than a connected account to which the illustrations are subordinate. Of the 496 figures in the book, 406 or over 80 per cent. are borrowed from other works or are from borrowed photographs. Is there not danger that the elementary student might get the idea from these borrowed pictures that entomology is a second-hand science? Most of the figures are good, but some could be greatly improved. Some of the cuts of butterflies attributed to Fiske are very poor; the specimens seem to have been slightly out of focus and the negatives thin and flat. The bronze copper butterfly is certainly not so rare that there is any excuse for using a photograph of a mutilated specimen. Fig. 116, labeled "A Myrmeleonid, the adult of the ant-lion," is a Chrysopid.

This portion of the work contains many misstatements, only a few of which can be noted here. The long rows of tree-cricket eggs in raspberry canes are still credited to *Œcanthus niveus* in spite of the recent work of Parrott (Fig. 110). In speaking of the armored scales, the surprising statement is made that "with the first molts the female loses her legs and eyes, and the body becomes a mere mass of yellowish protoplasm with long thread-like mouth-parts," etc. The American rose-slug is given one generic name in the figure (Fig. 385) and a different one in the text; a similar slip occurs in the case of the screw-worm fly (Fig. 376). On page 243 it is stated that most of the larvæ of the Hymenoptera live within the food, exception being made of the first two families (Tenthredinidæ and Siricidæ). This is an inaccurate statement in the case of the larvæ of most of the aculeates as well as many parasitica. The remarks upon the ovipositor of Siricidæ apply only to that family in the strict sense, and not at all to the other families, which we are forced from the keys to assume are included under the term Siricidæ. The only definition of the stigma that is found appears in the statement under Cynipidæ that they lack "the dark spot or stigma toward the end of the anterior margin of the wings." The largest Braconidæ are stated to be not over one eighth of an inch in length, and the largest Proctotrypidæ not over one twenty-fifth of an inch; an astonishing statement in view of the fact that the typical genera *Bracon* and *Proctotrypes* both contain species measuring 10 mm., not to mention still larger common forms in other genera.

In Part III., Laboratory Exercises, six chapters are devoted to the external and internal anatomy of insects, the comparison of different types of arthropoda and of insects, the study of mouth-parts, etc. These exercises

are carefully arranged, are well written and apparently have been tried out with elementary classes. These chapters form the most satisfactory part of the work.

In chapter XXII., Classification of Insects, keys are given by which the student is supposed to be able to determine insects to orders and families. Here the authors have not been so fortunate.

The classification of the Hymenoptera adopted (p. 319) is woefully inadequate even for a very elementary text, and does not represent any of the progress made within the last quarter of a century. Granting the diversity of opinion that still prevails in regard to many points of the classification of this order, there is, however, much that has been done within that time that can not properly be ignored.

The inclusion of saw-flies, gall-flies and parasitic Hymenoptera in one suborder, as contrasted with all the remaining groups (aculeates) in another, is indefensible. The inclusion of Lydidæ and Xyelidæ in the Tenthredinidæ, and of Cephidæ, Xiphydriidæ and Oryssidæ in with Siricidæ has no longer any justification. On the other hand, the best founded work on ants to-day recognizes but a single family, comprised of five subfamilies. It would seem that this position might at least be advantageously maintained in an elementary key which, for the sake of brevity, omits mention of many important families. Neither this course was followed nor the alternative of including five family groups. On the contrary, three family names appear in the key, Poneridæ, Myrmicidæ and Camponotidæ. The Dorylidæ, relatively unimportant in this country, as well as the very important Dolichoderidæ, are not mentioned. The latter includes the economically important Argentine ant (referred to in the text on page 259 as belonging to the Myrmicidæ) as well as several very common North American forms which the casual student is far more likely to frequently meet with than he is with any Poneridæ. By the key all the Dolichoderidæ would fall into the so-called Camponotidæ, with which they have no closer relation than have any of the other groups of ants. The term *Camponotidæ* for the group containing the genus *Formica* is used for Formicidæ, despite the fact that the superfamily name Formicina based on that genus is used directly above it—a rather astonishing neglect of the established customs as well as codes of nomenclature.

There may be some excuse for omitting from the key such families as Evaniidæ, Stephanidæ, Trigonalidæ, Sapygidæ and Mellinidæ, but to be consistent the equally uncommon Masaridæ should be omitted. But why is there no place provided for the Larridæ, Nyssonidæ, Philanthidæ, Pemphredonidæ and Crabronidæ, all of which are abundant in species and individuals? The majority of the species belonging to these families fall, according to the key, in the Bembecidæ, the others in Sphecidæ, but the division is along a line that can make no pretense of being natural or even convenient.

It might also be noted that there is no provision made for wingless Hymenoptera in the keys and that therefore the wingless parasitic species, the worker ants and female Mutillidæ can not be classified. The term Psammocharidæ is used for Pompilidæ or Ceropalidæ of older authors, but the name Proctotrypidæ is not replaced by Serphidæ.

The whole principle of key construction with the intention of omitting "less important" forms is open to grave objection. The result is that the student chancing upon a specimen of a non-included group (and in the present case such specimens will be legion) ends in running it out to a family to which it does not belong, and confident in the correctness of his labors and unsuspecting the untrustworthiness of the key, has it impressed upon his memory as one of the types of that family. A far better method, in fact the only defensible method where keys are presented, is to make them complete enough to provide correctly for *all* forms coming within their scope, and then if deemed desirable rare or less important groups may be bracketed or set in special type. Otherwise it were better the tables were omitted altogether.

The key to the families of Diptera is written by an eminent authority in that group and will doubtless prove one of the most valuable parts of the book. Unfortunately some of the smaller families are omitted. The most serious drawback, so far as the present work is concerned, is the fact that the old and complicated Schinerian system of wing venation nomenclature is used, but nowhere explained, the explanatory figures of wings of Diptera, as in the other orders, being lettered by the Comstock-Needham system. The wing of *Blepharocera* is figured, although the Blepharoceridæ are omitted from the keys and the text does not explain that the intricate maze of intersecting lines are not veins, but folds in the wing membrane. They will surely puzzle any one who does not appreciate that fact. "Second boscal" cell (bottom of p. 323) is probably a misprint.

The wings of Hemerobiidæ are not ordinarily opaque, as stated in the table on page 307. Only one family of Trichoptera is recognized, although all authorities to-day would agree in recognizing more. Only one family of Thysanoptera is recognized, despite the fact that modern authorities recognize two suborders and several families.

In the key to families of Hemiptera the first category is "wingless insects with fleshy unjointed beak," its alternative is "winged or wingless insects, with a jointed beak," but under the latter is a subheading which provides for wingless insects with the beak wanting! Further, the beginner would often experience difficulty in recognizing the jointed character of many Coccid beaks.

The Aphidæ are differentiated from Aleyrodidæ and Coccidæ by having "long and slender legs and transparent wings," while the two latter are said to have "legs short, wings usually opaque." It is hardly necessary to mention the many legless Coccidæ, as well as the long-legged forms (*Orthezia,* etc.).

In the table to Coleoptera the majority of families are omitted altogether, and so are very many in the Lepidoptera. In the discussion of the latter order no mention is made of a division into two suborders Jugatæ and Frenatæ, but the *butterflies* and *moths* are said to form two main divisions of the order. The wing of *Hepialus,* however, is figured and the jugum noted in the legend. Such an insufficient statement as "subcosta and radius of hind wing connected by a cross-bar" is noted in the characterization of Sphingidæ.

The work closes with chapters on collecting and preserving insects, which will be of great value to the student.

The book is well printed on good paper and the illustrations, as a rule, come out well; when properly revised, it will make a welcome addition to the rapidly growing list of entomological texts, from which the teacher can choose the one best suited to the needs of his students.

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Dynamic Meteorology and Hydrography. Part I., Statics. By V. BJERKNES and J. W. SANDSTRÖM. Quarto. Pp. 234. Part II., Kinematics. By V. BJERKNES, TH. HESSELBERG and O. DEVIK. Quarto. Pp. 175 (with atlas of 60 charts). Carnegie Institution, 1911.

The object of this treatise is to develop practical methods for the systematic study of the pressure, temperature, humidity, density and velocity of the atmosphere. On account of the difficulty of solving the differential equations of a viscous gas the methods are almost entirely graphical, elaborate tables being given that obviate the necessity of even ordinary integration. In Part I. it is assumed that the conditions of equilibrium are fulfilled along every vertical line. From the records of a balloon sent up with self-registering instruments for pressure, temperature and humidity, it is therefore possible to calculate the pressure and density at different heights. For facility of calculation the authors divide the atmosphere into sheets each about 1,000 meters thick, beginning at sea level, and find the average density and temperature of each sheet. To allow for the humidity and still use Boyle's law, as for dry air, a virtual temperature is used that is derived from the